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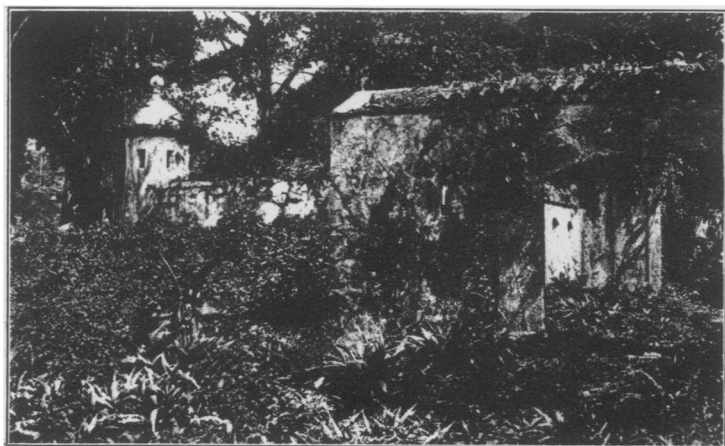
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Ferns of the Isthmus of Panama

GEORGE F. CLEVELAND

I have been requested by several members of the Fern Society to write an article for the new FERN JOURNAL on the ferns of the Isthmus of Panama. I will begin by saying that I have practically no knowledge of the genera or species of the tropics, and my time is somewhat



GATEWAY AND WATCH TOWER AT FORT SAN SEBASTIAN, PORTO BELLO, PANAMA

limited. I am very glad, however, to do what I can to help along our new official publication. The following notes will be mainly descriptive, and divided under the headings of locality, geological conditions, and atmospheric conditions.

I am located at Porto Bello, Panama, which is about twenty miles from the Canal Zone proper, and presents some considerable differences in vegetation from the Canal Zone. The flora of this section is somewhat restricted in species, owing probably to its proximity to

the sea, to its comparatively low elevation, the character of the soil, and excessive moisture. The place is famous in song and story as the point of departure of the Spanish treasure ships carrying the gold, silver, and precious stones of Peru to Spain, also as the scene of the desperate raids of the buccaneers, particularly of Morgan and Drake. Ruins of the old Spanish buildings and fortifications are still standing, and show a wonderful state of preservation considering the severe climatic conditions and the abuse and neglect to which they have been subjected.

The region that has come under my observation comprises a hilly country on both sides of a long and narrow bay and low swampy lands at the head of this bay. The country is covered with virgin forest which forms an almost impenetrable jungle, and this, added to the precipitous nature of the hills and the treacherous character of the swamps, makes extensive collection or observation very difficult.

Geological conditions: Geologically, this region is primitive in the extreme, being composed mainly of irregular and scattered chains of ragged, precipitous hills, thrown together and jumbled into a tangle which follows neither scheme nor direction, and is composed exclusively of basalt. They appear to have been thrown up by some terrific volcanic disturbance, and boiled and seethed, the short line in many places showing folds and bubblelike formations, resembling nothing in the world so much as melted sugar poured on ice. This rock formation is of a very high degree of hardness and homogeneity, though veins of quartz and feldspar occasionally occur.

As would be expected, in a locality with an excessive rainfall, the surface has been modified by erosion and weathering, though to a surprisingly small degree, owing to the great hardness of the rock. There occur also deep

deposits of a heavy red soil, due largely to the rapid decay of the dense tropical vegetation.

The climatic conditions—due largely to the comparatively low and narrow strip of land separating the Atlantic from the Pacific, allowing a meeting of air currents from two oceans, combined with a comparatively high temperature—produce a tremendous evaporation and precipitation. The temperature is very constant; it seldom if ever goes below 72° Fahrenheit or above 95°. These conditions produce a vegetation which is dense and luxuriant, though for some curious reason which I have been unable to discover, it is rather lacking in variety, and there is a noticeable scarcity of flowers. Ferns are in abundance, growing everywhere and in all kinds of situations, apparently without regard as to whether it is rock, soil, or tree trunk. I have found plants of a species of *Polypodium* growing on rocks on the seashore which during heavy winds would be covered by breaking surf, and the same species growing on trunks of trees on the summits of the highest hills, seemingly equally at home in either situation.

Although they grow in such profusion, I have been astonished and disappointed in the few species I have been able to discover, probably not over thirty in all. Most of the species so far discovered seem to fruit freely, and many of them also propagate freely by means of adventitious buds, yet of two or three species, out of hundreds of plants examined, I have been unable to find one single fertile frond.

In another article I will endeavor to give some detailed information concerning the more noticeable species and genera, with possibly some drawings or photographs.

CRISTOBAL, C. Z., PANAMA.